TWO NOTABLE LANDSLIDES.*

GEORGE D. HUBBARD.

The landslide is the sort of phenomenon to have caught the attention of the geologist of a century ago, but with our present substantial grounding in uniformitarianism, and in our attempt to appreciate duly the ordinary, we are more than likely to underestimate the importance of the extraordinary. Hence, I want to call attention to this rather remarkable, and, in some localities, prevalent, process of denudation.

In many of the newer valleys of southeastern Ohio, land slide topography is almost omnipresent. Hundreds of acres of land along the steeper valley walls have been ruined or badly damaged for agriculture by slipping, and tumbling down the slopes, or by being covered with material which has tumbled down. The sliding usually so mixes the soil with the subsoil, or that part of the regolith yet unprepared for supporting plant growth, that the soil can no longer be used. Further, the tumbled, bunchy condition of a landslide prevents cultivation and harvesting, and even hurts the area seriously for pasture.

Within historic time, there have been thousands of landslides of various sizes in the hilly part of this state, and many occur every year even down to the present time. In the aggregate they must be rather important physiographic phenomena. During the past sixteen months a considerable number of minor, fresh heaps of tumbled debris have been examined, and two very extensive piles have been studied.

The first notable landslide studied in Ohio occurred in the spring of 1906, near the training track of a Mr. Corwine, about two miles up the Scioto from Waverly. The upper (Pre-Wisconsin) outwash terraces are here very extensively developed, and well preserved. Going northward or northwestward across the level upper terrace-top past the training track, one approaches a place where an area comprising many acres of the terrace has gone down 1–25 feet and slipped forward toward the stream carrying fine rich pasture and scattered, old oaks down with it. The slip has the appearance of recency. The section through the outwash here is, from the top downward, washed gravel and sand with much fine, poorly-sorted, material, 25–30 feet; then blue clays and fine sands ideally stratified and containing, occasionally, strata of brown iron-stained sand, or layers bearing black sand of garnets, magnetite and some more valuable metallic oxides. This fine clay and sand attains an exposed thickness

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of 25–40 feet and may be underlain by micaceous sand behaving like quicksand, although no true quicksand could be located except a seam in a well, up on the terrace at a depth of 20–30 feet and at a distance from the landslide of more than a half mile.

The landslide began by the falling of the front of a steep bluff of this outwash material after it had been undermined by the stream (a branch of the Scioto from the west). This was followed by the settling down of 10–15 acres of the adjacent terrace land, and the horizontal layers of blue clay and sand exposed in the stream bed for a generation were made to buckle and fold as if pushed up from below or crushed laterally, and then forced forward into sharp folds. This stratified clay, turned up vertically, rose across the valley obstructing the channel and effectively ponding the waters back. A lake a fourth mile long was formed, whose overflow is slowly cutting an outlet notch through the vertical layers of tough clay.

Such a slide could hardly have occurred unless there had been a yielding stratum below in which slipping could take place, hence the supposition of quicksands, or micaceous layers at least, beneath the surface.

The more remarkable physiographic effects of this slide are (1) the lowering and tumbling of an area of level pasture and scattered timber several acres in extent, through a vertical distance of one to twenty-five feet; (2) the folding and pushing up of a series of horizontal clay layers; (3) the ponding back, by the latter phenomenon, of the waters, and the production of a temporary lake; (4) the complete closing of a large spring and its re-formation in a new place several rods distant and a few feet higher.

The second large landslide occurred many years ago. It lies in and rather completely closes the valley between the head of Cranenest Fork of Little Muskingum and a short branch of Oppossum Creek about one and one-half miles west of Winkler's Mill, Monroe county, Ohio. The topography of the vicinity is shown on the New Martinsville and New Metamoras sheets of the United States Geological Survey topographic map.

At the point indicated, the divide is about 1110 feet above sea level, but has the appearance of a low col in a valley whose walls rise over one hundred and fifty feet above the crest of the col. The material of this divide is loose rock waste with a bunchy surface considerably subdued by subaerial agencies and deeply gashed by headward erosion. On the east side of this divide the little branch of Oppossum Creek falls 100 feet in one-fourth mile and another hundred in less than a full mile. This branch is on rock back to the landslide. Cranenest Fork, flowing N. W., falls 100 feet in about one mile and another hundred feet in about

2½ miles. It is not on rock until more than one half mile from the landslide. Westward along this creek a distance of seven to eight miles, or, about to the crossroads called Cranenest, the tributaries all enter the main creek barbed, as if the latter had been reversed since their courses were established. The altitude of the bed of the stream here is only 830 feet above sea level a depth reached by Oppossum Creek about two and one-half miles from the divide. The fact that the streams are on rock so near the divide does not prove that the valley floor here before the landslide was no lower than the bed rock now exposed. It suggests that the landslide and accompanying or ensuing aggradation covered the old rock floor, in such manner that, subsequent erosion was not directed along the line of the previous axis of the valley; but that the streams, cutting through the mantle rock where they found themselves, have in places, encountered rock at much higher levels.

The physiographic effects of this landslide seem to have been (1) the plugging of a valley several miles below the divide to such an extent that (2) the waters of a southeast flowing stream leading to Oppossum Creek were ponded back and made to rise in a lake and flow over the divide into a branch of Little Muskingum now called Cranenest Fork, and thereby (3) the course of a stream for seven or eight miles was reversed, and this much of one creek was removed from its head and added to the head of another. Since the reversal, the col-divide, over which the waters were forced, has been cut down, and the stream now flows out westward by an easy grade; while to the eastward, the short stream, tributary to Oppossum creek, and thereby, to the Ohio, is rapidly endeavoring to push its headwaters back and recover its lost territory.